Space Weather Forecast

Issued on Thursday, 03 March 2022 at 12:59 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/Minor Geomagnetic Storm likely in UTC day of Friday. Smaller chance of similar from Coronal Mass Ejection (CME) Sunday. Slightly increasing chance of R1 Minor Radio Blackouts.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was moderate over the period, with occasional common-class flares and one moderate-class flare. The moderate flare was observed from an apparently unremarkable small bipolar sunspot group at 02/1739UTC. This spot was one of six on the sun, with a possible seventh developing and fading in the southeast within the 24-hour window.

The sunspot responsible for the moderate flare now appears to be decaying. Near the sun's western horizon, a pair of sunspots remained magnetically simple, mature and stable. On the eastern solar horizon, a newly-arrived region slowly revealed itself to be bipolar in terms of complexity, with this spot previously part of the rationale for the expected uptick in X-ray activity to end this week - so far not borne out. The northeastern solar horizon is showing some signs of an impending sunspot arrival here, and some degree of increased flare risk is still proposed.

In terms of other groups, the southeastern quarter was perhaps the most dynamic, showing a strong growth trend (at least for a time), in the bipolar groups here, however this was not capped off by any noteworthy flares.

The M-class flare resulted in a Coronal Mass Ejection (CME) that was observed largely directed eastwards (trailing the Earth in the track of its orbit) on available imagery during the UTC evening of 02 March. There is a slight chance gleaned from available MOSWOC modelling output that there may be some peripheral influence form the CME around or after 06/1200UTC, although confidence in this aspect is not high. No other potentially Earth-bound CMEs were in evidence.

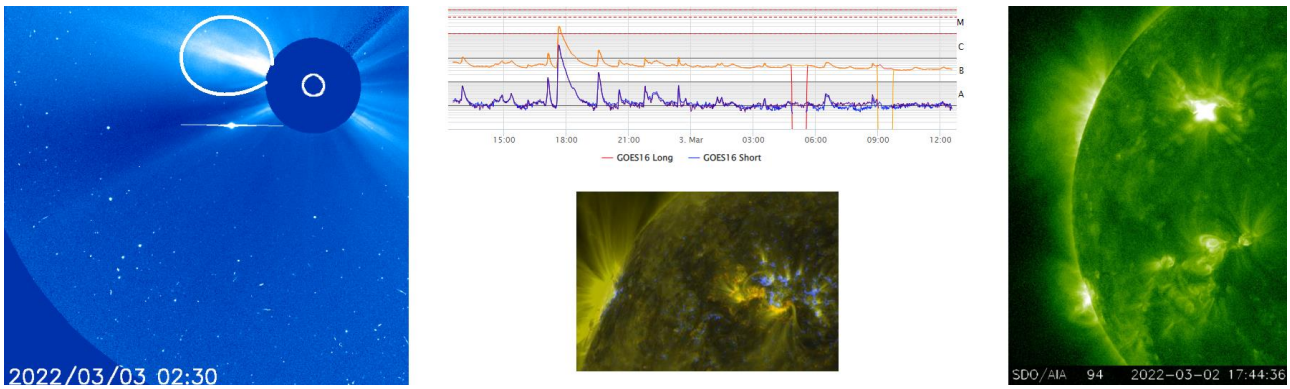

Figure 1: Clockwise from left: Satellite imagery of resltant CME from 02/1739UTC X-ray flare; X-ray flux over the past 24 hours; False colour extreme UV imagery of the event (upper right); 03/1200UTC composite image of magnetic structure within the sunspot.

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Solar Wind / Geomagnetic Activity: The solar wind was reflective of waning fast wind influence, probably stemming from one of up to three previously analysed minor 'coronal holes' near the sun's western horizon. The solar wind speed gradually declined in the 24 hours, while the number of particles in the wind and their associated magnetic field were both unremarkable.

The net result of these solar wind measures was provisionally quiet Kp throughout - at or near the very bottom of the measurement scale.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be low, with occasional common-class flares. However, there is an increasing chance of increasing to moderate levels, with the risk of isolated moderate-class flares perhaps bolstered by further sunspots arriving over the eastern horizon before the UTC weekend.

Solar Wind / Geomagnetic Activity: Earth is likely to experience a fast wind from a large (pair of) coronal hole(s) over the period, with Minor Geomagnetic Storm G1 Likely on day two, Friday 04 March. There should then be a lull before a much more uncertain possible swipe from the 02/1739UTC moderate-class flare-linked CME on day four, Sunday 06 March. The most reliably quiet geomagnetic conditions should therefore be in the very near-term and again once any high speed stream has matured, perhaps later on Saturday 05 March. The moderate-class flare-tied CME is the only one to feature in the forecast.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	40	60	5	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	20	25	25	25
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	2	3	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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